Environmental Protection Agency
Emergency and Remedial Response
August 1984

EPA

Superfund Record of Decision:

Wade Site, PA

TECHNICAL REPORT DATA

(Please read Instructions on the reverse before completing)

1. REPORT NO. EPA/ROD/R03-84/009	2.	3. RECIPIENT'S ACCESSION NO.
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15. SUPPLEMENTARY NOTES		

16. ABSTRACT

The Wade site is a three acre parcel of land on the banks of the Delaware River. It is located nine miles south of Philadelphia in Chester, Pennsylvania. From approximately 1950 until the early 1970's the site was the location of a rubber recycling facility which shredded tires and other post-consumer rubber products. During the early 1970's the site was converted to an illegal industrial waste storage and disposal facility. Drums of waste were emptied either directly onto the ground or trenches, severely contaminating soil and the ground water. Approximately 150,000 gallons of waste chemicals remain on-site.

The recommended alternative selected for this site consists of: removal, decontamination and disposal of on-site tires and tankers, removal of on-site waste piles; demolishing buildings, leveling the site, and filling and grading the property up to 12 inches over the existing grade to cover any protruding subsurface structures which have not been removed; removal down to the depth at which the first acceptably contaminated sample was found (based on a contamination cutoff level recommended by the RI/FS contractor); and covering the site with top-soil and seeding the cap to minimize erosion.

Key Words: Compliance with Environmental Laws, Negotiations, Capping, Excavation, Ground Water, Cost Recovery, Potential Responsible Parties

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Record of Decision: Wade Site (ABM), PA Contaminated media: gw, soil, air Key contaminants: over 100 organics, metals and inorganics		

18. DISTRIBUTION STATEMENT	19. SECURITY CLASS *(This Report)* None	21. NO. OF PAGES 30
	20. SECURITY CLASS *(This page)* None	22. PRICE

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ENFORCEMENT DECISION DOCUMENT
REMEDIAL ALTERNATIVE SELECTION

Site: Wade
Chester, Pennsylvania

Documents Reviewed

I am basing my decision on the following documents describing the analysis of the cost and effectiveness of remedial alternatives for the Wade Site:

- Focused Feasibility Study, Wade Site, Chester, Pennsylvania, Metcalf & Eddy, Inc., April 1984.
- Draft Report, Result of Soil Analysis and Cost Estimates for selected Remedial Activities regarding the Wade Hazardous Waste Site in Chester, PA, Roy F. Weston, November 1983.
- Summary of Remedial Alternatives Selection
- Public Comments and Recommendations
- Responsiveness Summary

Description of Selected Remedy

- remove and dispose of tires and tankers
- remove on-site waste piles
- demolish buildings
- test contents, remove contents, and close two underground storage tanks

The building on this site will be demolished and the remaining slabs will be left on site for future use. All demolition rubble will remain on the property and used for fill material.

- level debris, fill and grade property
- remove and dispose of contaminated soil

The purpose of this activity is to remove from the property any contaminated material and any material that will hinder subsequent efforts to fill and grade the site.

- cover with topsoil and seed cap
- operation and maintenance of site

Declarations

Consistent with the Comprehensive Environmental Response Compensation and Liability Act of 1980 (CERCLA) and the National Contingency Plan (40 CFR Part 300), I have determined the removal, decontamination and disposal of tankers, tires and debris; destruction of buildings, leveling, filling and grading the site; and covering with a seeded topsoil cap at the Wade site is the least costly alternative of all the remedial options reviewed that provides for current and future protection of public health, welfare and the environment. The State of Pennsylvania has been consulted and agrees with the approved remedy. In addition, the action will require future operation and maintenance activities to ensure the continued effectiveness of the remedy. Settlements have been reached between EPA and the responsible parties based on the selected remedy.

I have also determined that the action being taken which includes the off-site transport of contaminated materials to a RCRA approved lined facility is the least costly alternative when compared to the other remedial options reviewed, and is necessary to protect public health, welfare, or the environment.

8/30/84
Date

Lee M. Thomas
Assistant Administrator
Office of Solid Waste and
Emergency Response

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
SOLID WASTE AND EMERGENCY RESPONSE

AUG 3 1984

MEMORANDUM

SUBJECT: Enforcement Decision Document Approval for the Remedial Action at the Wade Site, Chester, Pennsylvania

FROM: Gene A. Lucero, Director Gene A. Lucero
Office of Waste Programs Enforcement

TO: Lee M. Thomas
Assistant Administrator

This Office has reviewed the Enforcement Decision Document and the Focused Feasibility Study for the Wade Site. I recommend that you approve the recommended alternative which will provide for future protection of public health, welfare, and the environment.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

JUL 30 1984

OFFICE OF
SOLID WASTE AND EMERGENCY RESPONSE

MEMORANDUM

SUBJECT: Enforcement Decision Memorandum for Approval of Remedial Action at the Wade Site, Chester, Pennsylvania

FROM: Russel H. Wyer, Director
Hazardous Site Control Division (WH-548E)

TO: Gene A. Lucero, Director
Office of Waste Programs Enforcement (WH-527)

The Enforcement Decision Memorandum and the Focused Feasibility Study for the Wade Site has been reviewed by my staff.

I Concur X

I Do Not Concur ______

I Concur with Comment ______

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

AUG 1 1984

OFFICE OF
ENFORCEMENT AND
COMPLIANCE MONITORING

MEMORANDUM

SUBJECT: Enforcement Decision Memorandum for Approval of Remedial Action at the Wade Site, Chester, Pennsylvania

FROM: Frederick F. Stiehl
Acting Associate Enforcement Counsel
for Waste (LE-134S)

TO: Gene A. Lucero, Director
Office of Waste Programs Enforcement (WH-527)

The Enforcement Decision Memorandum and the Focused Feasibility Study for the Wade site has been reviewed by my staff.

I Concur ✓

I Do Not Concur ____________________

I Concur with Comment ______________

Summary of Remedial Alternative Selection
Wade Site
Chester, Pennsylvania

Site Location, Description and History

The Wade site is a three acre parcel located on the banks of the Delaware River, just nine miles south of the City of Philadelphia, in Chester, Pennsylvania. The site is located in the industrial portion of Chester and is two blocks from the residential portion of the City. The site is bounded by the Commodore Barry Bridge, the Delaware River, a railroad right-of-way, and property owned by the Philadelphia Electric Company. From approximately 1950 until the early 1970's, the site was the location of the Eastern Rubber Recycling Company, a firm which shredded tires and other post-consumer rubber products. This use was abandoned during the 1970's and the site was converted to an illegal industrial waste storage and disposal facility. Drums of wastes were emptied either directly onto the ground or into trenches, thus severely contaminating soil at several locations, as well as jeopardizing the ground water beneath the site. In February 1978, a fire broke out which was so severe that the Commodore Barry Bridge was closed for 6 hours and 45 firemen required examination at the local hospital. As a result of the fire, one of the site buildings was completely destroyed and two others were seriously damaged. Large piles of debris containing exploded drums, building materials, tires, and shredded rubber (from the rubber re-cycling operations), and chemically-contaminated earth littered the property. Approximately 150,000 gallons of waste chemicals remained after the fire; most of the material was contained in 2,500 55-gallon drums located inside the fire damaged buildings, although a large portion was stored in 5 bulk tankers in the front lot.

In 1980 and 1981, contractors were engaged by the Pennsylvania Department of Environmental Resources (DER) and the U.S. EPA to remove and dispose of the drums (and their contents) contained in the buildings, to remove and dispose of the contents of the tankers, and to perform an investigation of the site's soil, ground water, and air quality. WESTON personnel served as the DER Site Representative for the day-to-day monitoring of Contractor activities.

Subsequent to the above on-site activities, CECOS was engaged by the DER in the summer of 1983 to investigate and characterize the remaining hazardous and non-hazardous elements of the site, such as debris piles and contaminated soil.

The following activities composed the scope-of-work for CECOS:

1. "pick through" the debris and rubble to isolate all drums;

2. analyze the contents of drums containing chemicals;

3. repackage leaking drums in secure containers;

4. stage drums containing chemicals in accordance with their contents;

5. crush all empty drums;

6. analyze soil and debris for contamination;

7. determine locations and quantities of contaminated soil and debris; and

8. determine quantities and compositions of drummed chemicals.

In addition to the above, CECOS staged the debris into separate piles (for tires and shredded rubber, wood, scrap metal, and potentially contaminated soil) and transported and disposed of all drums containing chemicals found during the site characterization.

Since the number of drums containing chemicals was not known until the characterization was complete, removal and disposal of such drums were not included in the scope-of-work, as described in the DER's request for proposals for this site characterization. It turned out that there were 750 drums containing chemicals. It was decided from a cost and safety standpoint that these drums should be removed and disposed under this contract rather than placing them in secure storage on the site for disposal under a later contract. The Contractor, therefore, was directed, under an explicit contract option for "out-of-lump sum" work, to perform the disposal activities. Empty drums were not disposed of.

CECOS was on the site from August 1 to September 10, 1983. During that time approximately 5,000 cubic yards of debris were picked through and staged in separate piles, approximately 750 drums containing chemicals were characterized; wastes were repackaged in secure containers when necessary; combined in compatible groups when possible; 630 drums were disposed; and 320 soil samples were obtained and analyzed.

The DER monitored work acceptability and efficiency through persons formally named (in the CECOS Contract) as Cleanup Director and Site Representative. The Cleanup Director had ultimate responsibility for the site and for monitoring the Contractor's performance. The Site Representative was an employee of WESTON who was on-site full-time and represented the Cleanup Director in his absence and was authorized to make specific decisions on behalf of the DER. All cleanup actions taken to date at the site by the DER were done with the concurrence of EPA. The Agency was intimately involved, both technically and legally, in the development and implementation phases of the cleanup. All proposed actions were reviewed to assure that they complied with Federal environmental regulations which existed at the time.

A separate report has been prepared by WESTON titled, "Cost Estimates for Selected Remedial Activities in Response to Hazardous Conditions present at the Wade Property in Chester, Pennsylvania." The analytical results of the soil sampling program performed by CECOS are presented in that report since they provide the basis for the cost estimates of removing contaminated soil.

A focused feasibility study (FFS) and Endangerment Assessment for the Wade site were tasked to Metcalf & Eddy, Inc., by EPA in February 1984. The FFS considers the endangerment and recommends the most cost-effective remedial alternative.

Current Site Status

A plan of the site is presented in Figure 1. The grid markings shown on the figure were used for locating the soil sampling points. As can be seen from the figure, the site contains seven structures, four rubber storage tanks, seven tankers, a pump pit, and eleven piles of debris.

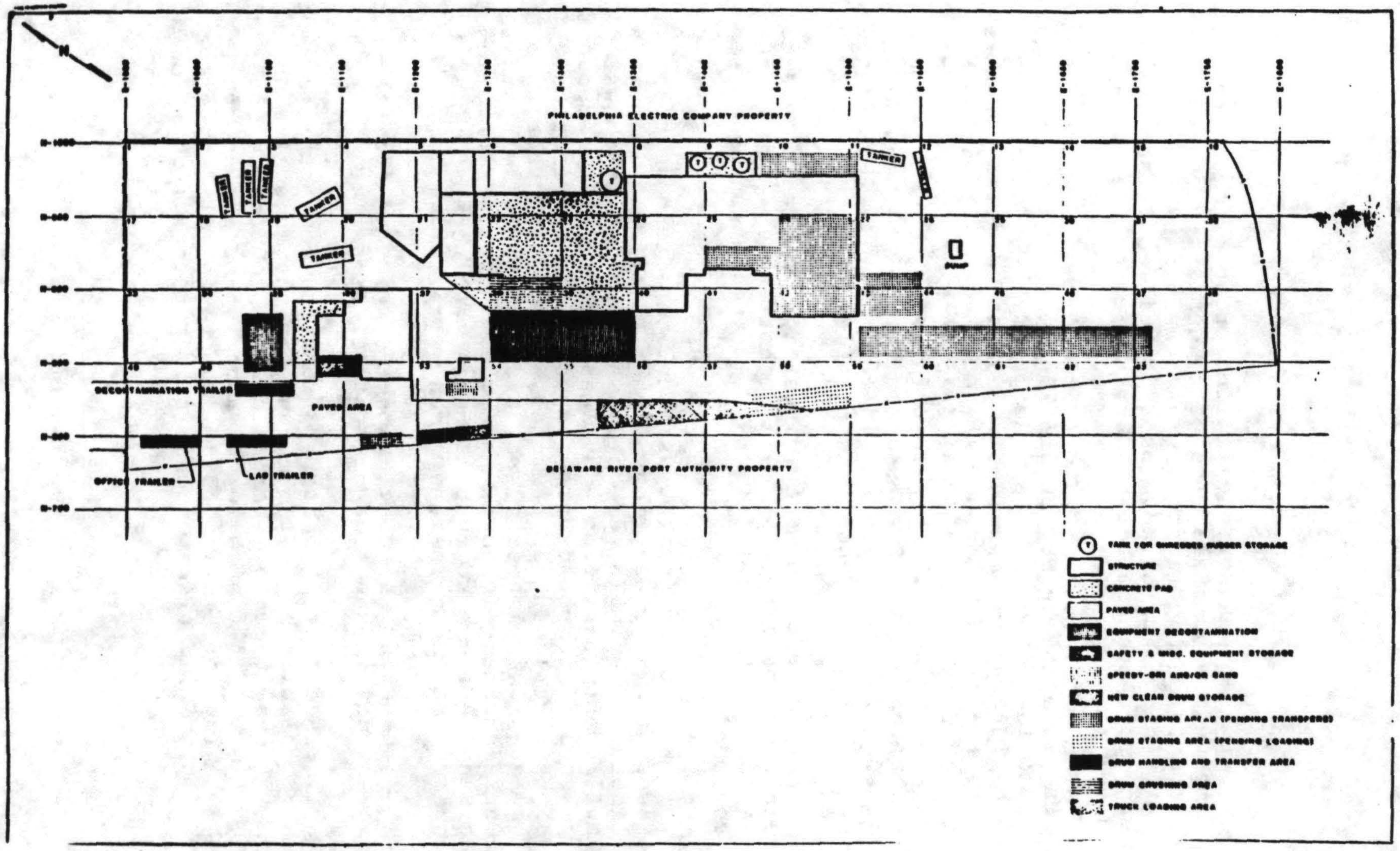
The structures vary in structural integrity from moderate to poor, all having been damaged by the fire in 1978. Although not indicated by the figure, the concrete pad underlying grids 22 and 23 was the floor of a two-story stone and brick building which was completely demolished in the fire. There is heavy machinery bolted to this pad and also in place in the building encompassed by grids 24, 25, and 26. In general, the buildings on the site pose a physical hazard, due to lack of structural integrity, to persons entering them or walking near them.

The tankers are empty with the possible exception of rainwater. Five of the seven tankers were used to contain solid and semisolid chemicals which were removed and disposed during the DER's cleanup operation in 1980. Like the buildings on the site, the structural integrity of the tankers ranges from moderate to poor and it is assumed that none of them is able to be towed over the road supported by its own undercarriage.

The pump pit is a concrete rectangular structure greater than 15 feet deep and currently back filled with soil. It is not believed that the pit is connected to the river though it historically contained a pump used to obtain process water for the rubber company's operations.

The piles of debris located at several parts of the site were formed as a result of the site characterization and contain separate categories of waste, such as: tires and shredded rubber, potentially contaminated soil, scrap metal, scrap wood, and crushed empty drums. All of these separate materials were formerly found mixed together in scattered piles across the site prior to the site characterization.

The site itself is level and essentially barren of vegetation due to excavation and grading performed during the site characterization. Vegetation was present, however, prior to those activities and it is expected to return.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LAB TRAILER
DELAWARE RIVER PORT AUTHORITY PROPERTY
TANK FOR SHREDDED RUBBER STORAGE
STRUCTURE
CONCRETE PAD
PAVED AREA
EQUIPMENT DECONTAMINATION
SAFETY & MISC. EQUIPMENT STORAGE
SPEEDY-DRI AND/OR SAND
NEW CLEAN DRUM STORAGE
DRUM STAGING AREAS (PENDING TRANSFERS)
DRUM STAGING AREA (PENDING LOADING)
DRUM HANDLING AND TRANSFER AREA
DRUM CRUSHING AREA
TRUCK LOADING AREA

Over one hundred different organic and inorganic compounds and metals have been identified on the Wade property during the course of investigations at the site. While the majority have been identified in surface soils many have been detected in both air and ground water samples taken from the site.

Sampling by R.F. Weston indicated that contamination of soils on the site is widespread. Weston divided the site into approximately 60 grids and sampled for total volatile organic compounds (VOC) and total baseneutral and acid extractable (BNA) fractions of priority pollutants at four points within each grid. Their results showed contamination by VOC, BNAs, or both of the top 12 inches of soil in nearly every grid. In general, BNA fraction was present in higher concentration than the VOC fraction.

Despite the numerous investigations that have taken place on the site, the data do not easily permit generalization of the areal extent of contamination by any one compound.

Many of the compounds found on site have been associated with a variety of health effects in humans, laboratory animals, or both, when inhaled or ingested in sufficient quantities. At least six organic compounds or classes of compounds are suspect human carcinogens; benzene, chlorinated benzenes, chloroform, tetrachloroethylene, trichloroethylene, and bis(ethylhexyl phthalate). Certain metals found at the site - hexvalent chromium and arsenic - are also suspect human carcinogens. Lead is also present in the soils and ground water.

The principal conclusions to be drawn from the site investigation and endangerment assessment are:

1. Based on the monitoring results, concentrations of volatile organic compounds on the Wade site do not present acute exposure hazards to persons on or off site. Although low by acute standards, concentrations of benzene found did present slighty elevated lifetime risks of cancer to persons directly on site.

2. Inhalation/ingestion of contaminated soil is potentially the most serious route of exposure for persons entering or playing on the site. Under the assumptions used in the FS, lifetime risks of cancer (10^{-4}) from inhaling/ingesting small amounts of contaminated soil on the site were higher than risks from other routes of exposure. Sampling results indicate that the concentrations of benzene found on the site are associated with risks of cancer that are 5-10 times higher than those considered as negligible. This finding applies only to persons with chronic exposures to soil on the site (i.e., children playing on the site over long periods of time). No evidence of potential acute health effects were found, a finding consistent with results of a study by the Center for Disease Control.

3. Persons entering the site may be exposed to toxic chemicals both in the air and in contaminated soil and are therefore the most susceptible population at risk from contaminants on the Wade Site.

4. Underground tanks and tunnels, structurally damaged buildings, and piles of flammable debris present immediate safety hazards to persons entering or playing on the site.

5. Drinking water and fish are not likely to be significant routes of exposure to chemicals from the Wade site. Ground water beneath the site is not used as a source of drinking water and concentrations of chemicals in the Delaware resulting from contaminated ground water discharge to the Delaware are estimated to be negligible.

6. Contamination on the Wade site is not expected to have a serious impact on the environment either through volatilization of chemicals to the air or release of contaminants via ground water to the Delaware River. Both releases have been estimated to be extremely low.

Enforcement

In December of 1978, EPA asked the Regions to list candidates for RCRA §7003 actions. The Pennsylvania DER, which had unsuccessfully ordered Wade and ABM to clean up the site in 1977, recommended the Wade Site. Waste leaking, spilled, or otherwise disposed from drums, tanks or other containers deemed to provide an imminent and substantial endangerment to health and the environment by the EPA. On April 20, 1979, the EPA commenced a civil action against Wade and ABM. The Court ordered them to clean up the site. The complaint was amended in March of 1980 to join Ellis Barnhouse and Frank Tyson, former presidents of ABM. When it became apparent that the current defendants were insolvent, a year long investigation of ABM's generator customers took place. After 32 generators settled for 1.6 million dollars, EPA sued the remaining 6 generators in the original clean-up action in December of 1981. In September of 1982 the Court dismissed the injunctive relief claims against the generators and EPA then commenced a CERCLA §107 cost recovery action which is the current basis for the action against the generators. In May of 1984, the remaining generators agreed to settle with EPA and the State. Settlement agreements are being negotiated.

Initial Remedial Alternative Screening

Several alternatives were evaluated by Mitre, NEK, Weston, EPA and DER. Based on an initial screening, the following alternatives were rejected:

1. Volatilization of volatile contaminants by excavating the soil and spreading it in thin layers and turning periodically to expose it to the atmosphere or placing the soil in windrows. This technique was rejected on the basis of low efficiency due to the small size of the site, no off-site location available, no removal of BN/A contaminants, the requirement of air monitoring, unpredictable weather conditions, and the possible requirement of mechanical aeration.

2. Land farming and composting, for aerobic degradation of organic contaminants. This alternative was rejected because of the possible requirement for commercially-developed mutant bacteria, the low concentrations of organic material present in the soil, required treatability studies and pilot testing, specialized equipment, long processing times, continuous monitoring and because the technique had not been proven for decontamination of soil.

3. Creation of a secure cell on-site, by means of an impermeable cover, continuous monitoring of ground water and possibly impermeable side walls or liner to prevent migration of contaminants away from the property boundaries. This alternative was rejected because the contaminated soil would remain in an urban area, the cell would have to be perpetually monitoried, the hydrological properties of the site are not suitable for a secure cell, the property would have to be restricted from other use and State and Federal permits may be required.

4. Total removal and off-site disposal of soil at a licensed, secured landfill and backfilling the site with imported soil. This alternative was rejected because site investigation shows the soil contamination is localized in discrete areas and because of the high cost of this solution.

Remedial Alternative Screening

In order to perform a detailed evaluation, it was necessary to develop a list of remedial alternatives which would include a No Action Remedial Alternative. Metcalf & Eddy developed 12 alternatives for the Wade site, based on Weston's six soil removal options. (See Table 2 for soil removal options.)

Alternatives:

1. No Action
2. Remove, decon & dispose of tires & tankers, remove on-site waste piles; demolish buildings, level site, fill and grade property.
3. Remove, decon & dispose of tires & tankers, remove on-site waste pile; demolish buildings, level site, fill and grade property, cover with asphalt cap.
4. Remove, decon & dispose of tires & tankers, remove on-site waste piles; demolish buildings, level site, fill and grade property, cover with topsoil and seeded cap.
5. Remove, decon & dispose of tires & tankers, remove on-site waste piles; demolish buildings, level site, fill and grade property, soil removal option 1A, cover with asphalt cap.
6. Remove, decon & dispose of tires & tankers, remove on-site waste piles; demolish buildings, level site, fill and grade property, soil removal option 1A, cover with topsoil and seeded cap.
7. Remove, decon & dispose of tires & tankers, remove on-site waste piles; demolish buildings, level site, fill and grade property, soil removal option 1C, cover with asphalt cap.
8. Remove, decon & dispose of tires & tankers, remove on-site waste piles; demolish buildings, level site, fill and grade property, soil removal option 1C, cover with topsoil and seeded cap.
9. Remove, decon & dispose of tires & tankers, remove on-site waste piles; demolish buildings, level site, fill and grade property, soil removal option 2A, cover with asphalt cap.
10. Remove, decon & dispose of tires & tankers, remove on-site waste piles; demolish buildings, level site, fill and grade property, soil removal option 2A, cover with topsoil and seeded cap.

11. Remove, decon & dispose of tires & tankers, remove on-site waste piles; demolish buildings, level site, fill and grade property, soil removal option 2C, cover with asphalt cap.
12. Remove, decon & dispose of tires & tankers, remove on-site waste piles; demolish buildings, level site, fill and grade property, soil removal option 2C, cover with topsoil and seeded cap.

Screening Considerations:

A. Ground water

The hydrological evaluation determined that the Delaware River is the outflow point for ground water from the Wade site. The results of the evaluation indicate that, based on all organic contaminants detected in ground water at the site, continued input of contaminated ground water to the Delaware River under the no-action alternative would not have a measurable adverse impact on water quality or biota, if contaminated soil was removed from the site. The concentrations of individual organics after mixing of ground water with both the estimated full flow and half flow of the Delaware River are all well below all applicable Ambient Water Quality Criteria and U.S. EPA Health Advisories for ingestion of toxic and carcinogenic compounds in water (Table 1). Therefore, due to the negligible impact of ground water on the off-site environment and public health, groundwater interception and withdrawal remedial actions were eliminated from further consideration.

B. Soil Excavation/Removal Remedial Alternatives

Six remedial alternative soil excavation/removal options (1A, 1B, 1C, 2A, 2B and 2C) were developed by Roy F. Weston based on either of two threshold levels of organic contaminants for defining whether the soil is contaminated (See Table 2.) One threshold level on which three of the alternatives (1A, 1B, 1C,) were based was 100 mg/kg for both the volatile and base neutral/acid (BN/A) fractions. The second, on which the remaining three (2A,2B, 2C) alternatives were based, was 100 mg/kg for the volatile fraction and 500 mg/kg for the BN/A fraction. Metcalf & Eddy reviewed the confirmed contaminated soil excavation quantities and potentially contaminated soil quantities for Options 1A, 1C, 2A and 2C, determined by R.F. Weston. A conservative approach was taken due to possible synergistic effects.

TABLE 1. DELAWARE RIVER CONTAMINATION ASSESSMENT

Compound	Groundwater Concentration (ug/L)	Station Number	Concentration in Delaware R.(1) after mixing-Full Flow (ug/L)	Concentration in Delaware R.(1) after mixing -1/2 Flow (ug/L)	Ambient Water Quality Criteria for Saltwater Aquatic Life
Acetone	139,000	B4A	0.1392	0.278	
Acetone and Dimethly Sulfide	9,000	B8A	0.0093	0.0185	
Acetone and Dimethyl Sulfide	2,800	B9A	0.0028	0.0058	
Benzene	3,100	B4A	0.0032	0.0064	5100 ug/L Acute; 700 ug/L chronic
Benzene	<2.0	B6,6A	0.000002062	0.000004	
Benzylchloride	21	B1A	0.000022	0.00004	
Chlorobenzene	2,200	B2	0.0023	0.0045	
Chlorobenzene	56	B6	0.00005776	0.000115	
Chloroform	27,000	B4A	0.028	0.05	
Chloroform	146	B8	0.0001506	0.0003	
Chloroform	144	B8A	0.0001485	0.0003	
Chloroform	53	B4	0.000055	0.0001	
Chloroform	50	B3	0.000052	0.0001	
Chloroprene	30	B1A	0.000432	0.000062	
Chloroprene	21	B9	0.000022	0.00004	
Dichlorobenzene	670	B2	0.0007	0.0014	1970 ug/L (acute)
Dichlorobenzene	<2.0	B6,6A	0.000002062	0.000004	
1,1 Dichloroethane	3,400	B4A	0.003507	0.007	
1,1 Dichloroethane	850	B8A	0.00088	0.00175	
1,1 Dichloroethane	118	B8	0.000123	0.00024	
1,1 Dichloroethane	54	B2	0.0000557	0.0001	
1,2 Dichloroethane	6,500	B3A	0.0067	0.0134	113,000 ug/L (acute)
1,2 Dichloroethane	282	B8A	0.00029087	0.00058	
1,2 Dichloroethane	88	B4	0.00009	0.0002	
1,2 Dichloroethane	74	B6	0.0000764	0.00015	
1,2 Dichloroethane	30	B8	0.0000309	0.000062	
1,2 Dichloroethane	24	B2	0.000025	0.00005	
1,2 Dichloropropane	7,050	B3A	0.0073	0.00005	10,200 ug/L (acute); 450 ug/L chronic
1,2 Dichloropropane	1,780	B4A	0.00184	0.0145	
1,2 Dichloropropane	450	B9	0.0004642	0.0037	
1,2 Dichloropropane	237	B9A	0.00024	0.0005	
1,2 Dichloropropane	229	B5A	0.000236	0.0005	
1,2 Dichloropropane	56	B2	0.000057	0.000115	
1,2 Dichloropropane	35	B8A	0.0000361	0.00007	
1,2 Dichloropropane	19	B8	0.0000196	0.00004	
Dimethisulfate	5,000	B3A	0.0052	0.01	

TABLE 1 (Continued). DELAWARE RIVER CONTAMINATION ASSESSMENT

Compound	Groundwater Concentration (ug/L)	Station Number	Concentration in Delaware R,(1) after mixing-Full Flow (ug/L)	Concentration in Delaware R,(1) after mixing -1/2 Flow (ug/L)	Ambient Water Quality Criteria for Saltwater Aquatic Life
Ethyl Benzene	730	B4A	0.00753	0.01506	
Ethyl Benzene	14	B6	0.00001444	0.00003	
Ethylether	8.0	B1A	0.00000825	0.000016	
Ethylether	4.0	B2	0.000004	0.000008	
Isopropyl Alchohol	17,000	B4A	0.01753	0.035	
Isopropyl Alchohol	900	B3A	0.00093	0.0018	
Isopropyl Alchohol	400	B2	0.000413	0.0008	
Isopropyl Benzene	100	B4A	0.000103	0.00021	
Isopropyl Benzene	15	B3A	0.0000154	0.00003	
Methylalchohol	1,200	B3A	0.00124	0.0025	
Methylene Chloride	11,400	B4A	0.012	0.0235	
Methylene Chloride	114	B3A	0.00012	0.0002	
Methylethylketone	7,700	B4A	0.0079	0.0158	
Methylisobutylketone	85,000	B4A	0.0877	0.1755	
Methylisobutylketone	1,270	B9A	0.00131	0.00262	
Methylisobutylketone	400	B8A	0.000413	0.0008	
Methylisobutylketone	60	B3A	0.000062	0.000124	
Methylisobutylketone	42	B4	0.00004332	0.000087	
Methylisobutylketone	3.0	B5	0.0000031	0.0000062	
Methylmethacrylate	1,100	B4A	0.001135	0.0023	
n-Propylalchohol	200	B2	0.00021	0.0004	
Tetrachloroethylene	21	B8A	0.000002062	0.000043	10,200 ug/L Acute; 450 ug/L chronic
Tetrachloroethylene	12	B9	0.0000124	0.000025	
Tetrahydrofuran	26,000	B3A	0.02682	0.054	
Tetrahydrofuran	2,300	B9A	0.002372	0.0047	
Tetrahydrofuran	1,400	B8	0.0014	0.0028	
Tetrahydrofuran	300	B1A	0.0003094	0.00062	
Tetrahydrofuran	280	B9	0.0028	0.00057	
Tetrahydrofuran	190	B7	0.000196	0.00004	
Tetrahydrofuran	170	B6A	0.0001753	0.00035	
Tetrahydrofuran	170	B6A	0.0001753	0.00035	
Toluene	12,400	B4A	0.013	0.026	6,300 ug/L (acute);5,000 ug/L (chronic).
Toluene	<2.0	B6,6A	0.000002062	0.000004	
Trans-1,2 Dichloroethylene	300	B8A	0.0003094	0.00062	224,000 ug/L (acute)
Trans-1,2 Dichloroethylene	30	B8	0.0000309	0.00062	
Trans-1,2 Dichloroethylene	6.0	B2	0.0000062	0.0000124	

TABLE 8 (Continued). DELAWARE RIVER CONTAMINATION ASSESSMENT

Compound	Groundwater Concentration (ug/L)	Station Number	Concentration in Delaware R,[1] after mixing-Full Flow (ug/L)	Concentration in Delaware R,[1] after mixing -1/2 Flow (ug/L)	Ambient Water Quality Criteria for Saltwater Aquatic Life
1,1,1 Trichloroethane	21,600	B4A	0.0223	0.0445	31,200 ug/L (acute)
1,1,1 Trichloroethane	425	B8A	0.000438	0.0009	
1,1,1 Trichloroethane	77	B8	0.0000794	0.00016	
1,1,1 Trichloroethane	72	B4	0.000074	0.00015	
1,1,1 Trichloroethane	49	B3	0.0000505	0.0001	
1,1,1 Trichloroethane	10	B1A	0.0000103	0.00002	
Trichloroethylene	5,300	B4A	0.0055	0.0109	2,000 ug/L (acute)
Trichloroethylene	24	B4	0.000025	0.00005	
Trichloroethylene	17	B3	0.00000103	0.000035	
Xylene	14,700	B4A	0.0152	0.03	
Xylene	616	B8A	0.000635	0.0013	
Xylene	63	B3	0.000065	0.00013	
Xylene	60	B4	0.000062	0.000124	
Xylene	56	B9A	0.00005776	0.0001	
Xylene	54	B5A	0.0000557	0.0001	
Xylene	42	B3A	0.00004332	0.000086	
Xylene	39	B1A	0.0000402	0.00008	
Xylene	36	B2	0.000037	0.000074	
Xylene	19	B5	0.00002	0.00004	
Xylene	11	B1	0.0000113	0.000023	
Xylene	<2.0	B2A	0.000002062	0.000004	
Xylene	<2.0	B6A	0.000002062	0.000004	

Table 2

Soil Excavation/Removal Remedial Alternatives

1. Remove contaminated soils exceeding organic contaminant concentration of either 100 mg/kg volatile organics or 100 mg/kg base, neutral/acid organics.

   A. Excavate to Last Contaminated Depth[1]
   B. Excavate to Intermediate Depth[2]
   C. Excavate to Uncontaminated Depth[3]

2. Remove soils exceeding an organic contaminant concentration of either 100 mg/kg volatile organics or 500 mg/kg base, neutral/acid organics.

   A. Excavate to Last Contaminated Depth[1]
   B. Excavate to Intermediate Depth[2]
   C. Excavate to Uncontaminated Depth[3]

1/ Soil removed down to depth at which last contaminated soil was found.

2/ Soil removed down to depth at which last contaminated sample was found if threshold level exceeded by 20 percent or less; one foot deeper than last contaminated depth if threshold level exceeded by 21 to 100 percent; and down to depth at which first uncontaminated sample was found if threshold level exceeded by greater than 100 percent.

3/ Soil removed down to depth at which first uncontaminated sample was found.

There are currently no standards for exposure to total volatile organic (VOC) or base neutral/acid extractable (BNA) fractions in soil. The toxicity of the contaminated soil depends in part on the individual compounds present and in part on any additive or synergistic effects that the compounds may exert together. Since no compelling toxicological evidence supports a threshold of 100 mg/kg of total VOCs or BNAs versus 50 mg/kg or 150 mg/kg, it is unlikely that any meaningful distinction can be made between excavating to "clean" depth or to one foot below the last contaminated sample on the basis of public health impact.

In several grids, the concentration composites indicated contaminant levels greatly exceeding the set threshold levels, yet analysis of the quadrants' analytical data indicates the opposite. In other grids, this relationship was reversed. These results suggest that the sampling method may not be an accurate indicator of the extent of contamination of the whole grid. While this lack of correlation is a general problem with all the soil removal options, it suggests that making distinctions between soils that are 20%, 21-100% or greater than 100% over the threshold is not valid over an entire quadrant. On the basis of the toxicological issues and the sampling discrepancies, Metcalf & Eddy concluded that soil removal options 1B and 2B are unjustified and should be excluded.

C. Remove Debris

Removal and disposal of on-site, crushed drums and contaminated soil pile(s) were included in the Removal of Debris remedial item. These had been included under the contaminated soil removal activity, however, it is more appropriate to consider them as part of removing site debris. A 50 percent swell factor was used for estimating the volume of crushed drums after loading into trucks for subsequent hauling to a final disposal site. A 15 percent swell factor was used for estimating the loading volume of soil from aboveground soil piles or excavated from the site for subsequent hauling to a final disposal site.

D. Demolish Building

Several items were added to the Demolish Buildings remedial activity. These included the following:

- Rough grading and site leveling up to 12 inches over existing grade in order to cover any protruding subsurface structures which have not been removed.

- On-site sump sampling and analysis and waste removal.

- Underground fuel oil tank/contents removal.

- Underground waste chemical/solvent tank contents removal.

- Closure of underground tunnel, filling in of building basements and vehicle weighing station pit. The tunnels and pit are potential reservoirs for off-site contamination.

These items were added to the Demolish Buildings remedial activity because it would be appropriate to undertake these items during the building demolition activity. Off-site, handling quantities of building demolition debris were calculated for the following scenarios: remove all debris from site for each soil excavation option under consideration (1A, 1C, 2A, 2C). These quantities are used in the subsequent cost analysis of remedial alternatives.

The site remains a safety hazard to persons entering or playing on the site and in abandoned buildings. Despite locked gates to the site, persons from the surrounding neighborhood are known to gain access to the site.

Initial remedial activities on the site have not removed all safety hazards from the site. Two partially full underground tanks, an underground 4-foot x 4-foot tunnel beneath the main building, and structurally damaged buildings present serious physical hazards to persons gaining access to the site. The identity of compounds in the remaining underground tanks have not been established as of this writing but nevertheless the tanks themselves are at least partly accessible from the ground. Both the tanks and the tunnel may contain oxygen deficient or toxic atmospheres that increase the likelihood of accidents. The major fire at the Wade site in 1978 damaged the structural integrity of several buildings on-site, increasing the likelihood of unexpected collapse. Finally, remaining piles of debris (wood and tires) are potential fire hazards.

E. Site Capping

The results of the Endangerment Assessment for the No Action remedial alternative, as previously discussed, indicated minimal risks as a result of on-site ground water contamination. On this basis, ground water interception, withdrawal and treatment remedial alternatives were eliminated from further consideration and detailed evaluation. The site capping options range from relatively impermeable clay capping to asphalt capping to relatively permeable topsoil/seeding capping. Clay capping is the most effective of these capping options at preventing infiltration of precipitation into the unsaturated soil zone (contaminated soil) and subsequent movement into the ground water.

Precipitation has and does infiltrate the unsaturated zone on-site and recharges the ground water, but its effect on ground water does not pose significant risks as previously discussed. Therefore, it is not necessary to prevent infiltration by installing a relatively impermeable clay cap or asphalt cap on the site.

Cost Analysis

Table 3 presents the site implementation costs for all the 12 remedial alternatives based on Metcalf & Eddy's cost estimates for Site Debris Removal, Building Demolition, Site Capping and Contaminated Soil removal.

Post Closure, Long Term Monitoring Plan

Once remedial activities have been completed on the Wade site, it is required that the site be further monitored for a period of 30 years to determine the effectiveness of the remedial activities.

The plan includes the following tasks:

1. Site Inspection:

   The site inspection will include a visual inspection of surface conditions and the monitoring wells.

2. Installation of Upgradient Monitoring Wells:

   Two upgradient monitoring well clusters will be installed in off-site locations in order to monitor the water quality of the ground water before it flows under this site.

3. Water Sampling:

   The purpose of this sampling is to determine ground water quality before ground water enters the site and ground water quality as it leaves the site.

4. Laboratory Analysis:

   Both water and soil samples will be analyzed for priority pollutants, cyanide and TOX based upon contaminants identified in previous site sampling. After five years of sample collections, the sampling protocol will be re-evaluated to determine if certain pollutants can be targeted such that there can be a reduction in the cost of laboratory analysis without any reduction in monitoring effectiveness.

TABLE 3 REMEDIAL ALTERNATIVE COST ANALYSIS

Remedial Alternative No.	Site Debris Removal ($)	Demolish Bldgs ($)	Site Capping ($)	Soil Excavation ($)	Total Implementation Cost ($)
1.	0	0	0	0	0
2.	529,029	268,745	0	0	797,774
3.	529,029	268,745	331,930	0	1,129,704
4.	529,029	268,745	75,620	0	873,394
5.	529,029	252,750	331,930	1,191,250	2,304,959
6.	529,029	252,750	75,620	1,191,250	2,048,649
7.	529,029	243,156	331,930	1,979,755	3,083,870
8.	529,029	243,156	75,620	1,979,755	2,827,560
9.	529,029	260,871	331,930	714,530	1,836,360
10.	529,029	260,871	75,620	714,530	1,580,050
11.	529,029	256,439	331,930	1,012,512	2,129,910
12.	529,029	256,439	75,620	1,012,512	1,873,600

5. Replacement of Monitoring Wells:

The present three downgradient well clusters were originally constructed with galvanized pipe and it is anticipated that the wells will need to be replaced in 10 years. The two upgradient wells will be constructed with stainless steel pipe and it is anticipated that the wells will need to be replaced in 15 years. Monitoring well deterioration may result from corrosion of the pipe or screen, accumulation of silt in the well, or plugging of the screens.

6. Well Maintenance and Rehabilitation:

A program of well maintenance and rehabilitation will be implemented every five years to insure that the monitoring wells will provide representative samples and that the surface integrity of the well has not been compromised.

7. Topsoil Maintenance:

A program of topsoil maintenance will be implemented every two years to insure that the topsoil cap completely covers the site. Periodically it may be necessary to fill in erosion channels, to add topsoil to areas where the vegetation has become sparse.

8. Mowing of Grass:

Once the topsoil cap has been constructed and it has been seeded and sodded it will be necessary to mow the new grass during the growing season. The task would be performed on a yearly basis probably during the summer months and will become a integral part of the site maintenance.

Community Relations

Public meetings were held in October 1982, July 1983, and September 1983 to discuss the remedial work performed by CECOS and the studies conducted by Roy F. Weston. Various types of media (e.g., newspaper ads, fact sheets, radio) were utilized to notify the public of these meetings. Representatives of U.S. EPA, State, local governments and the community were all well represented. Copies of reports and data were provided, with a 20 day comment period.

A public meeting to discuss the Wade site feasibility study was held at Chester City Hall on Wednesday, June 13, 1984. The meeting was conducted by the PA DER and EPA. Public officials and citizens were very interested in the future use of the site as well as the timeframe for completion of the cleanup. There were no written comments received.

Recommended Alternative

Section 300.68(j) of the National Contingency Plan (NCP) [47 FR 31180, July 16, 1982] states that the appropriate extent of remedy shall be determined by the lead agency's selection of the remedial alternative which the agency determines is cost-effective (i.e., the lowest cost alternative that is technologically feasible and reliable) and which effectively mitigates and minimizes damage to and provides adequate protection of public health, welfare, and the environment. Based on our evaluation of the cost-effectiveness of each of the 12 proposed alternatives, the comments received from the public, information from the Endangerment Assessment, and information from DER and Weston, we recommend that alternative 10 be implemented. This alternative includes: the removal, decontamination, and disposal of tankers, tires and debris; destruction of buildings; soil removal; leveling, filling, and grading the site, and covering with a seeded topsoil cap.

The recommended alternative is the least cost alternative that is technically feasible and reliable, that meets the requirements of the NCP and provides for future protection of public health, welfare, and the environment. It also complies with RCRA by calling for offsite disposal of contaminated soil at a RCRA approved lined facility, and the level of cleanup was determined in a manner consistent with the RCRA methodology. In comparison with the other alternatives, alternative 10 has the following:

1. Fewer monitoring requirements as a result of the topsoil cap;
2. Requires less time to implement of all the soil excavation options (lowest quantity of contaminated soil requiring excavation);
3. Easiest to install of the soil options due to the smaller soil excavation quantities;
4. Uses relatively proven technology, i.e., contaminant source removal with proper disposal;
5. More durability with a topsoil cap than asphalt due to a longer period of time that the level of effectiveness can be maintained;
6. More effective than the no action remedial alternative and non source removal alternatives;
7. If no action was chosen, we would still have the problem of a release occurring which would ultimately end in a ground water investigation;

8. The exposure rate of most concern for the Wade Site from the standpoint of public health is inhalation/ingestion of contaminated surface soils. Further removal of soil beneath the 5 foot level (Alternative 12) would have no impact on this route of exposure, and;

9. Removal of contaminated soil down to 5 feet allows for protection of human health and environment in the future.

The estimated costs for the recommended action are:

Remedial Action	Estimated Cost
Site Debris Removal	$ 529,029
Demolish Buildings	$ 260,871
Site Capping	$ 75,620
Soil Excavation	$ 714,530
Total Implementation Cost =	$1,580,050
Operation & Maintenance	$ 320,000
Total =	$1,900,050

Project Schedule

- Approve Record of Decision	July 1984
- Award Contract	September 1984
- Start Construction	September 1984